## Antonow's Rule, Wetting Transitions and Dynamical Analogy in Amphiphilic Systems

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This paper deals with theoretical foundations underlying a strategy for evaluation of interfacial tensions between the equilibrated phases in a three-phase fluid mixture consisting of a microemulsion that is in equilibrium simultaneously with an oil-reach upper phase and a water-rich lower phase. According to this strategy, known in the literature as Antonow's rule, the tension of the oil-water interface is equal to the sum of the tensions of the oil-microemulsion and mcroemulsion-water interfaces.

Antonow's rule is valid exactly throughout the range of three-phase equilibrium states over which one of the phases spreads between the other two. Alternatively, when Antonow's rule fails, the coexisting phases meet at line of three-phase contact. This is the Young's-law regime. As the thermodynamic state changes, the system may undergo a transition from the regime described by Antonow's rule to that in which the three tensions satisfy Young's equation. More precisely, the models of interfacial phenomena in amphiphilic systems considered in this paper belong to two different groups.

The first group of models originates from the van der Waals theory of capillarity and its applications to inhomogeneous fluids. The basic concept underlying the models in this group is that of a free-energy functional. The second group include lattice models with well defined molecular Hamiltonians for which one can evaluate the partition function, exactly or by approximation.

Summarizing, this paper describes investigations of the validity of Antonow's rule in amphiphilic systems using the models described above. In particular, the model free-energy functionals are applied to confirm the existence of the Antonow's rule regime in the vicinity of critical- and tricritical points, respectively. Moreover, applicability of the lattice models to such studies is discussed. In particular, a dynamical analogy, according to which the interfacial density profile is represented by the dynamics of a particle moving on a line is used to show that in the framework of the classical one-density van der Waals theory of interfaces, one can impose conditions on the admissible intermolecular potentials ensuring that Antonow's rule is valid in the entire phase diagram.